

Energy Systems Integration Facility Workshop



Thermal Systems and Buildings Integration

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ESIF Purpose



Workshop Breakouts

- Electricity Systems
- Bulk Power Systems
- Thermal Systems and Buildings
- Hydrogen and Fuel Cells systems

Labs

- **Thermal Storage Materials**
- **Thermal Storage Process and Components**
- **Power Systems Integration**
- **HPC and Insight Visualization**

Attendees:

- **NREL: Greg Glatzmaier, Jamie Keller, Craig Turchi, Ryan Elmore, Bill Livingood**
- **LBNL - Chris Marnay**
- **Univ of Colorado - Gregor Henze, Frank Barnes**
- **EPRI – Harshal Upadhye**

Topics of Discussion

- **How do Renewable Energy and Energy Efficient technologies fit into your goals?**
- **What are the top 3 challenges you face?**
- **Which ESIF capabilities can help you overcome those challenges?**
- **What type of capabilities are missing from the ESIF ?**

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How do Renewable Energy and Energy Efficient technologies fit into your goals?

- RE with storage can provide load shifting
- Power sector has always wanted storage; need different storage types, scales, ramp rates, and locations in grid (including in buildings) to work together

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What are the top 3 challenges you face?

- Politics (e.g., hard to get pumped hydro accepted by all parties in CO)
- Where do we locate storage, at what capacity, peak power, type, and what cost?
- How will PHEVs, EVs, V2G affect load, system design and ancillary services?
- Economics. High cost even of thermal storage? Is storage seen as generation or transmission, who pays, and what are tax credits?

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Which ESIF capabilities can help you overcome those challenges?

- **Sophisticated expensive models that would be difficult for people to purchase and run and the capability to validate them**
- **Means to investigate and solve problems of integrating RE into grid**
- **Can investigate system of systems and real-time controls**
- **Sophisticated measurement capabilities (e.g., thermophysical properties)**

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What type of capabilities are missing from the ESIF ?

- **Need to broaden thermal storage testing temperature range.**
- **Non-CSP thermal storage applications**
- **Mechanical, adsorption/desorption, etc.?**
- **Thermal storage for micro CHP (e.g., to run absorption or adsorption chillers)**

Interacting with Other ESIF Capabilities

- 30 kW electric heater could provide thermal energy to other labs
- CAES testing: compressor and turbine in another lab, thermal storage in our lab
- Combine thermal storage with batteries in Energy Storage Lab to provide combined storage capability
- We do thermal part of micro CHP; interact with environmental chamber

Summary

- **Strong modeling and validation capabilities accessible at low cost**
- **Cost of storage needs to be addressed and reduced**
- **Thermal storage labs now viewed much more broadly**
 - Non-CSP thermal storage
 - Other types of storage (not electric)
- **Did not have utility representative**
- **Need to optimize storage mix in terms of types, capacity, peak power, location, ramp rates**
- **Some opportunities for inter-lab coordination (CAES, micro CHP)**